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General view of Batesford Quarry, looking South-east over the central part of the quarry. See page 5 for more.

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THE FOSSIL COLLECTORS' ASSOCIATION OF AUSTRALASIA

SECRETARY/TREASURER
Frank Holmes, 15 Kenbry Road, Heathmont. Victoria. 3135. (03) 9729 0447
EDITOR
Paul Tierney, 2 Mahogany Drive, Caboolture. Queensland. 4510. (07)5499 0875
E-mail: palaeo@microed.com.au

STATE REPRESENTATIVES
Australian Capital Territory
Mrs. M. Webb, Fairlight Station, R.M.B. 141, Weston. 2611. (02) 6236 5123
New South Wales
Eric Nowak, 29 Bungalow Road, Roselands. 2196. (02) 9758 1728
South Australia
John Barrie, 1 George Terrace, Coonalpyn. 5265. (08) 8571 1172
Queensland
Ian Sobbe, M/S 422, Clifton. 4361. (07) 4697 3372
Victoria
Frank Holmes, 15 Kenbry Road, Heathmont. 3135. (03) 9729 0447
Western Australia
Mrs. L. Schekkerman, 11 Marion Street, Innaloo. 6018. (08) 9446 3583

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EDITORIAL NOTES

I think one of the most memorable aspects of last years field trip was the destruction I saw along the Walsh River. I had to walk a 3.5 kilometre stretch of the Walsh, to where "Dave" the plesiosaur was found, and every mudstone nodule for 3.4 kilometres had been broken up, this wasn't only limited to the river as every side gully had fallen to the same treatment. As to who was responsible, the footprints and tyre tracks told me it wasn't the cows and conversations with the people who live in the area soon told me who it was and where the fossils ended up. I go collecting with the attitude that I will leave some for other people, it would be nice if other fossil collectors (dealers) would do the same. To those people that I promised an ammonite, I am sorry.

Because of this, and other cases of trespass, the manager of Wrotham Park Station, Henry Burke, has asked me to pass on to all fossil collectors who are thinking of collecting from Wrotham Park, the following message. The Blackdown access to Wrotham Park is now going to be fenced and a locked gate placed across the road. With the help of Chillagoe police, regular patrols will be conducted and anyone caught on Wrotham Park without permission will be prosecuted to the full extent of the law. It must be pointed out that this warning is not only meant for fossil collectors but for shooters, fisher people and campers as well. Those wishing access to Wrotham Park should contact the manager, in advance, and present themselves at the house on the first day of their visit. Does this mean Wrotham Park has been shut down to fossil collectors, yes if the collector doesn't first have permission to go onto the property.

The fossil deposit near Rockhampton, central Queensland, is continuing to turn up new and exciting animals and it is one that will probably shed new light on the evolution of eastern Australia's rainforests to a period no older than three million years ago. The area is strange in the sense that in one spot we have a rainforest fauna preserved, then in another spot, about ten metres away, we have an arid zone fauna preserved. While dating still has to be completed (an expensive ask in itself) on the material, sieving and acid work is turning up the odd strange tooth for which there are no examples and thus create a huge challenge to identify. As mentioned above, this deposit has the possibility to cause a major rethink on just how quickly eastern Australia has dried out, this will be even more interesting if the deposit is more younger than it is older. It is indeed exciting to be involved in a fossil deposit that has the potential to provide new information on a small part of Australia's past faunal assemblage and shed new light on the environmental conditions that once existed on the east coast of the continent.

I have been banned from any long field trips during 2001, with our third child arriving in March I can understand Julie's desire not to see me leave home for any more than a couple of days. I am lucky to have a wife that allows me to travel into the back of beyond for two weeks every year while leaving her at home with the kids, so I guess the request to have one year off isn't asking too much. My eldest, Ayla, is becoming quite vocal about joining me on a field trip, so I am hoping to be able to utilise a long weekend sometime during this year to take her out and introduce her to the world of fossil collecting.

I recently received a letter from a new member from South Australia, Jeff Tonkin. Jeff has asked that if anyone has a spare copy of ***The Encyclopedia of Australian Fossils*** could they please contact him as he would like to obtain a copy. Jeff can be contacted on 08 8535 4362.

The Fossil Collector, Bulletin No. 61, p. 19 contained a story on the recently discovered remains of a giant ground sloth called *Eremotherium eomigrans*, which was found near Gainesville, Florida. Florida member Jewel Pozefsky has informed me that she is involved in the recovery of this animal and that it is a very exciting dig. At 2.2 million years old, the fossil is the oldest of its kind to be found in North America, it was larger than today's African bull elephant and migrated north from South America across the Panamanian Land Bridge. It is believed that large herds of the animals moved across the Florida Peninsula up until the last ice age. If any other members are involved in digs to recover fossils, please inform me so that I can tell other readers of *The Fossil Collector* what we are up to.

The deadline for the next issue of *The Fossil Collector*, Bulletin 63 will be March 26, 2001.

Vale Batesford Quarry

1890 – 2000

Chris Ah Yee*, Janice Krause* and Ken Bell**
* 20 Bayley Street, Hamilton, Victoria. 3300.
** 120 McCallum Road, Inverleigh, Victoria. 3321.

The well-known Batesford Limestone Quarry, 12 km to the west of Geelong, Victoria, is to close down in December 2000. For over 100 years it has been a prolific source of fossils (apart from its limestone!). It was also the type locality of the Tertiary Batesfordian (Lower Miocene) Stage. The closure was for commercial manufacturing financial reasons, not a lack of suitable material for cement manufacture.

HISTORY

Limestone deposits were first recognised in the Batesford area in 1888 by Richard Taylor, who with Peter McCann, a Geelong stonemason, established a cement plant at Fyansford in 1890. Subsequently McCann acquired the company and the McCann family has had continuous links with the cement industry in the Geelong region since that time.

The quarry lies to the south of the Dog Rocks, a Cambrian granitic massif, and which was to form a large part in the development of the Batesford Limestone deposit. In the early days there were two quarries: (a) the **Upper Quarry** was on the left bank of the Moorabool River and was the source of a brown, dense building stone called "Moorabool Stone" which was used in part of the City Court building in LaTrobe St., Melbourne, in the facing of the Malvern P.O., Melbourne, and in the Bendigo Roman Catholic Cathedral, as well as other buildings in Geelong; (b) the **Filter** (or Dryden's) **Quarry**, on the right bank was a source of limestone for agricultural purposes and cement making. From the base of this quarry came the dense limestone used as dripstone filters. Both of these early quarries are now covered with overburden from the **New Quarry**, opened in 1929 about one kilometre south of the Filter Quarry, and by the diversion of the Moorabool River in 1931. There was a further river diversion in the 1990's to open up rich deposits in the northeast section of the quarry. The cement manufacturing plant is about 5 km from the quarry at Fyansford. In the early days the limestone was carted between the two by dray or truck. After the New Quarry opened a narrow gauge rail line was installed. Later (in the 1950's) an overhead conveyor system replaced the train and is still in operation.

The limestone can be traced in bores to the northeast and east e.g. at Murtcairn some 20 km away.

The first mention of fossils from the area was by Hall & Pritchard (1892) who described a cliff section on the Moorabool River near to where the Upper Quarry later began production. They listed 128 species from the marly beds.

GEOLOGICAL OVERVIEW

The present quarry covers some 200 hectares. Bowler (1963) has discussed in detail the general geology and sedimentology of the area. In simplistic terms the sediments present can be divided into two parts – an underlying white, soft, friable limestone about 70 metres thick which is overlaid by marls about 20 metres thick. The limestone is detrital. Originally, reefs grew in shallow, warm water on the exposed sides of the adjacent Dog Rocks and, after death and erosion, were deposited at depths of 20-200 m (Foster 1970) in quiet water downslope. In the deeper offshore areas from the Dog Rocks marls were being deposited to the east and south of the limestone. With relative sea-level change the Dog Rocks were gradually covered by deeper water; when this happened reef growth stopped, limestone production ceased and the clays/marls were deposited over the entire area.

The lowest limestone sediments exposed on the west and southwestern sides of the quarry are mainly bryozoal, calcareous sands with a large content of gritty fragments (quartz, feldspar, biotite, etc.) and larger (up to 80mm) pieces of angular to well-rounded granite. These beds contain a small molluscan fauna (*Ostrea*, *Pecten*), several species of brachiopods, the echinoid *Lovenia*, barnacle plates, rare shark teeth, calcareous algae, rare ostracodes and a restricted foraminiferan fauna. These early beds grade both laterally and vertically into a cleaner bryozoal limestone in which *Ostrea* disappears but *Spondylus* enters although specimens are quite uncommon. This in turn, in its top 10 metres, grades into a foraminiferal limestone where the larger foraminiferans *Lepidocyclina howchini howchini, Operculina complanata*, and in places, *Cycloclypeus carpenteri* are dominant. The dripstone hard band, which formed the base of the Filter Quarry, lies near the top of this foraminiferal limestone. It is 30-60 cm thick and a good marker bed around most of the quarry. Thin sections show that its fauna is similar to the underlying limestone. It may have formed during a period of partial exposure and is overlaid by foraminiferal limestone with a similar fauna for about 1 metre. During the deposition of the main body of the limestone there were episodes of marly deposition as clay bands, often extensive laterally but usually no more than 50 cm thick, are to be found. These occur especially on the southeastern side of the quarry where the water depth was greater as the quarry sediments as a whole have a slight dip to the southeast.

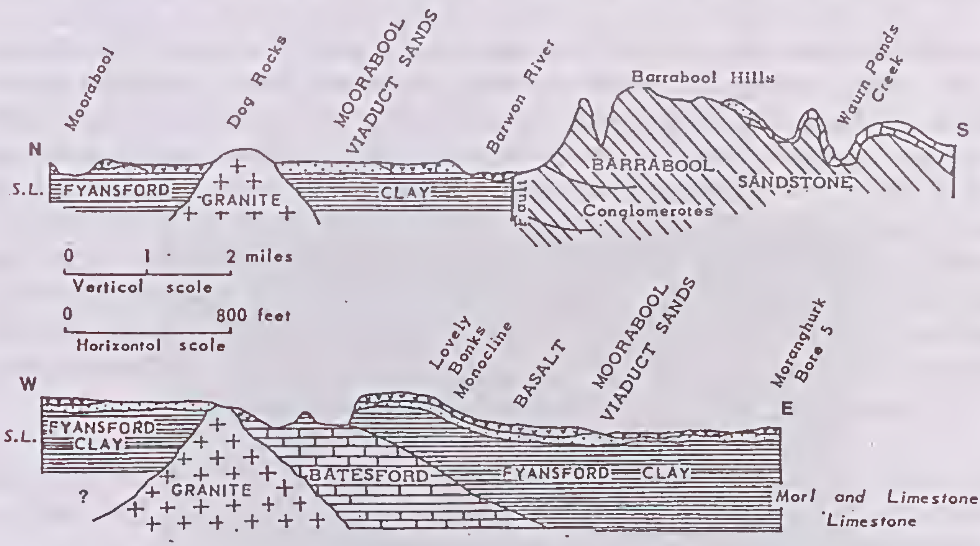

Figure 1. Idealised cross-sections through the quarry showing the relationships of the various formations (after Spencer-Jones 1967).

Then a change in environment occurred. Muddy sediments began to be deposited with the bryozoal limestone and gradually, over some 3 metres, the limestone ceased to form and marly beds only were deposited. In this zone the larger foraminiferans and the bryozoans gradually disappeared. The marls have a rich molluscan and foraminiferal fauna both indicative of deep-water deposition (middle to outer shelf).

The limestone section that contains the large foraminiferan *Lepidocyclina howchini howchini* was defined as the Batesfordian Stage (Singleton 1941). As this foraminiferan only occurs in the upper part of the limestones then the lower limestones are Longfordian in age. The overlying marls, which have been variously called the Fyansford Clays or Fyansford Marl but are now referred to as the Fyansford Formation, are of Balcombian age. Overlying the marls is a gravelly, unfossiliferous 3-5 metre section considered to be Moorabool Viaduct Sands (very late Miocene-earliest Pliocene). Incised into these Moorabool Viaduct Sands, and in places the underlying marls, is an old river channel filled with a newer basalt (Pleistocene) flow.

PALAEONTOLOGY

There have been few papers that deal with the fossil faunas of the quarry as an entire entity. Chapman (1908) described the foraminifera and ostracoda from the Filter Quarry listing 90 foraminiferan and nine ostracode species. Heron-Allen & Earland (1924) studied some samples sent to them in England by Hall and greatly expanded the foraminiferan fauna; they list 270 species. Foster (1970) analysed the echinoid faunas present in the limestone and found there to be two components – one, the spatangoids, indigenous to the limestone, the other, the regular echinoids, reworked from their original living habitat. Darragh (1985) has placed the overlying marls at Batesford into his Molluscan Zone XI (of Balcombian, Middle Miocene age) and lists 52 key taxa for this zone.

The following brief review of the faunas is **not** complete and the references **not** exhaustive but are only to give a guide to the various taxonomic elements (and show the biases of the authors!).

Mollusca.

Notwithstanding the richness of the molluscan fauna in the marls no detailed studies have been made. The fauna seems to be closely similar to that from both Muddy Creek (near Hamilton) and Balcombe Bay, Victoria, the fauna of the former having been dealt with in detail by Tate (1886-1893); Darragh (1970) in his Catalogue of Tertiary mollusca has updated the generic nomenclature. The molluscan fauna includes cowries (perhaps

6 species including *Gigantocypraea gigas, Palliocypraea gastroplax*, the flanged cowry), volutes (*Voluta hannafordi, Temivoluta antiscalaris), Natica* (several species), *Conus* (several spp), *Turritella, Murex, Fusus, Bathytoma, Solarium,* harps, olives, marginellids, turrids, triforids, scaphopods, etc. and the bivalves *Glycimeris, Corbula, Nucula, Venericardia*, etc., with the bivalves being less common than the gastropods. Very rare cephalopods have been seen. Unfortunately the larger molluscs are usually badly fractured due to the swelling and drying out of the clay which stresses the shell matrix. Janssen (1989), in a review of the Australian Tertiary Pteropods, lists 5 species from the Fyansford Formation at Batesford.

There is only a sparse molluscan fauna in the limestones – bivalves are restricted to occasional specimens of *Ostrea* in the lower beds with *Pecten* and *Spondylus* in the succeeding beds and only one species of gastropod is recorded, *Cellana cudmorei* (and that from two specimens), but recent collecting has produced several specimens of what appears to be a different, smooth shelled patellid.

Figure 2. *Palliocypraea gastroplax*

Brachiopods.

Identifications must rely on Tate (1880, 1886) and Allen (1939, 1940) although Richardson (1980) has revised some of the nomenclature. There are at least seven species (Chapman listed 11) found in the limestones and several more in the marls.

Echinoids.

The Batesford Limestone contains two distinct echinoid faunas – (a) Rock-dwelling shallow water Regularia whose fragments are a constituent of the sediment, and (b) burrowing deeper water Spatangoida which were indigenous to the limestone itself.

From specimens in Museum Victoria Palaeontology collections, from verifiable information in published papers and from personally identified material in private collections the following species are known from the Batesford Quarry:

From the limestones are recorded –

Regulars:
Heliocidaris ludbrookae Philip 1964
Ortholophus spp indet. Philip 1969
Phyllacanthus duncani duncani Chapman & Cudmore 1934
Strongylocentrotus antiquus Philip 1965
Zenocentrotus peregrinus Philip 1965

Irregulars:
Actapericulum bicarinatum Holmes 1995
Amoraster paucituberculata McNamara & Ah Yee 1989
Apatopygus sp. cf. *mannumensis* Holmes 1999
Cyclaster archeri (Tenison Woods 1867)
Clypeaster sp. cf. *C. gippslandicus* McCoy 1879
Echinoneus dennanti Hall 1907
Eupatagus rotundus Duncan 1877
Eupatagus sp. cf. *E. murrayensis* Laube 1869
Eupatagus sp. indet.
Gillechinus cudmorei Fell 1963
Lovenia forbesii (Tenison Woods 1862)
Orbispala occultiforma Irwin 1995
Pericosmus torus McNamara & Philip 1984
Studeria elegans (Laube 1869)
Victoriaster gigas (McCoy 1882)

From the Fyansford Formation:
Clypeaster sp.
Hemiasteridea sp.
Schizaster abductus Tate 1891

The inclusion of *Actapericulum, Amoraster, Apatopygus* and the Fyansford Formation *Clypeaster* in the above lists are a result of collecting by the authors during the last twelve months. These together with *Cyclaster, Gillechinus* and *Studeria* are very rare at Batesford, three of the genera being recorded from only a single specimen.

Victoriaster gigas is probably the largest of all the non-flexible echinoids to have lived; the largest known specimen has a length of 220 mm, width 205 mm and height 110 mm. Originally placed in the genus *Pericosmus* by McCoy (1882) and later *Linthia* (Pritchard 1908), the species eventually became the holotype of a new genus *Victoriaster* (Lambert 1920). This name was retained by McNamara and Philip (1984), the genus being placed in the family Schizasteridae

Plates of the stout-tested regular echinoid *Phyllacanthus duncani duncani* Chapman & Cudmore 1934, together with its long cylindrical primary spines are often found in large quantities throughout the limestone section of the quarry. Other elements of a rocky littoral fauna found scattered throughout the limestone are the regular echinoids *Heliocidaris, Strongylocentrotus* and *Zenocentrotus.* Unfortunately these ornate echinoids with their distinctly flattened underside are rarely preserved whole.

One echinoid worthy of special note is the rare holectypoid *Echinoneus dennanti* described from the "Filter Quarry" by T. S. Hall (1907). Apart from the specimens found at Batesford it has so far only been recorded from a Mallee bore in Victoria and at Cape Grim in Tasmania. Recent collecting in the present quarry has yielded several small and partial specimens and one complete specimen about 45 mm long.

Bryozoa

MacGillivray (1895), Maplestone (1898-1913) and Stach (1933-1935)

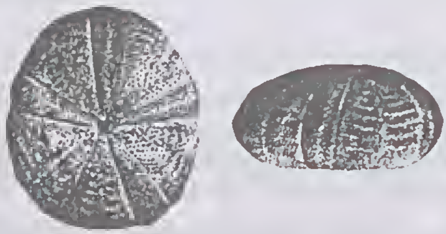

Figure 3. *Echinoneus* sp. (from Treatise, vol U).

Figure 4. Plates of *Phyllacanthus duncani duncani* Chapman & Cudmore. These are very common in the limestones. (from Philip 1963).

Figure 5. *Victoriaster gigas* (McCoy). This large echinoid is common but is seldom found in an unfractured state. (from McCoy 1882).

described many of the bryozoan species but these are in dire need of modern taxonomic appraisal. P. Bock, Deakin University has recently begun this revision. The total fauna is probably in excess of 150 species.

Corals

These are confined to the marls. Dennant's papers (1899-1904) are useful for identification, but again the taxa need a modern revision. Common genera include *Flabellum, Conosmilia, Notophyllia, Deltocyathus, Platytrochus* and *Trochocyathus*.

Barnacles

Surprisingly, this group has been fairly well documented in recent times (Buckeridge 1985). Eleven species were recovered from the limestones, belonging to the genera *Calantica, Smilium, Verrusa, Eolasma, Pachylasma, Bathylasma, ?Mesolasma, Hexalasma, ?Tetraclitella, Acasta* and *Elminius*. From his study Buckeridge suggested a threefold zonation within the limestone with a deepening sea and cooling of the climate during deposition. More recent collecting has shown that the ranges of some of the species within the limestone to be more extensive than previously known. Plates are quite rare in the marls.

Cetaceans

Occasional pieces (vertebrae, ribs) of cetaceans are recovered from the limestone but in earlier times, when excavation techniques were not as brutal as at present, several cetacean skulls were found. Fordyce (1991) refers to undescribed squalodont and sperm whale remains.

Fish

Otoliths (earbones), representing several kinds of fish, occur in the marls; these can be partly identified using Stinton (1958, 1963).

Sharks

For a long time the quarry has been considered a shark-tooth hunters delight but teeth are not really that common. Kemp (1991) reports 14 species, included in the genera *Isurus* (6 spp), *Charcharais* , *Carcharinus, Sphyrna, Galeocerdo, Carcharodon, Pristiophorus* and *Notorynchus*.

Sponges

Evidence that sponges were present when the marls were deposited is

Figure 6. Panoramic view of part of the northern face of the quarry.

found in the numerous free spicules occurring in washings and also in the relative commonness of the vermiform gastropod *Siliquaria*, the present day representatives of which live within the water canals of recent sponges. Hinde (1900) described a calcareous sponge, *Petroninia halli*, from a marl outcrop along the nearby Moorabool River and several other taxa from the similar-aged Sherwood Limestone at Flinders. Recent extensive collecting has shown that several genera of these calcareous sponges (*Petroninia, Bactronella* and *Tretocalia*) are scattered throughout the limestone with at least one form present in the marls. K. Bell is undertaking a study of these calcareous sponges and a brief article on them appeared in *The Fossil Collector*, Bulletin No. 61, September 2000, p 5.

Foraminifera

As mentioned above Chapman (1910) and Heron-Allen & Earland (1924) studied the foraminiferans recording some 270 species, mainly benthic forms. These studies did not differentiate clearly between the marl and

G: gravels; M: marls; L: limestone.

limestone faunas nor did they give the stratigraphic range changes of the species present because of the restricted exposures and/or samples then available to them. The lower limestone beds contain a foraminiferal fauna that includes *Sherbornina cunemarginata, Planorbulinella plana, P. inaequilateralis, Operculina complanata, Calcarina verriculata, Amphistegina hauerina, Notorotalia clathrata, Sphaerogypsina globulus, Discogypsina howchini, Cibicides* spp, *Robulus* spp and *Guttulina* spp. No diagnostic planktonic foram species have been found in the lowest limestone beds, so far. With the incoming of *Lepidocyclina* higher in the sequence the foraminiferal fauna has a large planktonic component – at least 9 species are present including *Globigerina woodi woodi, G. praebulloides, Globigerinoides quadrilobatus trilobus, G. bisphaericus* and *Globoquadrina dehiscens*. As yet the total planktonic fauna of the marls is undetermined, although the age diagnostic *Orbulina suturalis* is present in the topmost beds. The larger foraminiferans in the limestone (*Lepidocyclina, Cycloclypeus, Operculina*) have been studied separately by Crespin (1941, 1943), with more recent comments by Carter (1964) and Chaponiere (1984). At present K. Bell is studying the foraminiferal distributions within the limestones and marls.

Ostracoda

Chapman (1910) listed and described nine species of ostracoda. More recently Warne (1986,1988,1990a,b) has restudied and partly described the fauna present in the marls and limestones.

The End

After mining ceases in November-December 2000, the sides of the quarry will be battered so removing all vertical cliffs and outcrops, the drainage pumps (about 15,000,000 litres/day) turned off and the quarry area will be allowed to fill to a stable depth of about 40 metres by natural groundwater seepage; it is thought that this will take some 5 years. For the past 18 months one of us (Ken Bell) has been collecting on an almost weekly basis from all available sites within the quarry on behalf of Museum Victoria, Palaeontological Collections, so that there might be a good representative collection for future researchers.

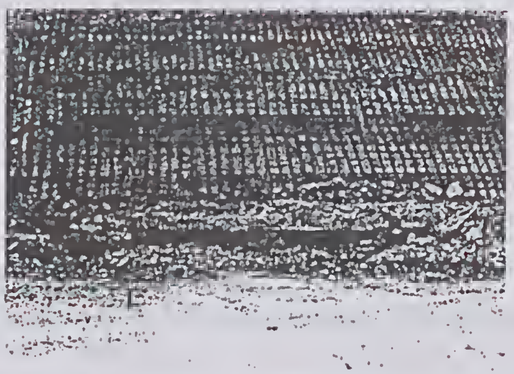

Figure 7 (above). Hard limestone dripstone band, just below the marls. L: limestone; M: marls; H: hardstone band, 30-60 cms thick. Vertical grooves due to excavation of the marls.

Figure 8 (right). Closeup of hardstone in Fig. 7.

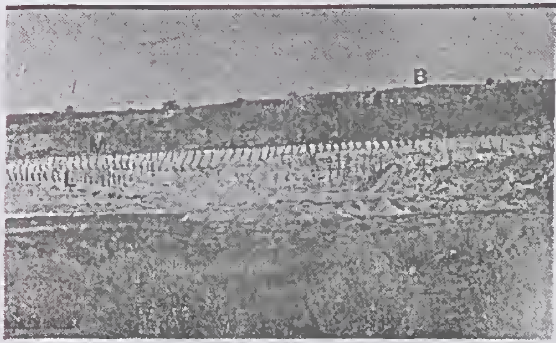

Figure 9 (above). View of the southern face of the quarry. B: basalt; M: marl; L: limestone.

Figure 10 (right). Entrance to the old tunnel used when trains carried the limestone to the cement making works some 5 km away, the tunnel is about 6 metres high. The top of the section shows the change from the limestone through the dripstone to the marls.

Acknowledgement

We thank Frank Holmes for assistance with the echinoid list.

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Palliocypraea gastroplax (McCoy 1875) in the Fyansford Clay

By Chris Goudey. 25 Cozens Road, Lara, Victoria. 3212.

Introduction

An interesting gastropod has recently been discovered in a small outcrop of the Fyansford Clay near Shelford, Victoria. The specimen, although crushed to some extent was exceptionally well preserved, and with careful removal and minimal repairs has become an eye-catching showpiece.

Early Recordings

Palliocypraea gastroplax was first described in 1875 by Frederick McCoy, from an incomplete specimen found at Fossil Beach, Mornington, Victoria. With the holotype, much of the flange is missing including the anterior canal. It was a large specimen and if complete, would have been more than 100 mm long.

A second specimen was found by Mr Walter Greed of Hamilton, Victoria in the lower beds at Clifton Bank, Muddy Creek and was donated to the National Museum in 1924. This specimen was a little smaller than the holotype, but it was complete. It measured 97 mm long by 90 mm wide.

Cossmann (1906) included *Cypraea gastroplax* in his subgenus *Palliocypraea and* makes reference to the Mornington specimen. Vredenburg (1920) refers also to McCoy's *C. gastroplax* maintaining the subgeneric name of *Palliocypraea* allied to *Gistortia.*

Gistortia, Jousseaume (1884) is a genus of large, mostly aberrant cowries, which have been found in parts of Europe and Asia, with possibly one species in Jamaica. They occurred from the Cretaceous to the Eocene. *Palliocypraea* is a monotypic subgenus, which is allied to *Umbilia* Jousseaume 1884, and is not to be confused with *Palaeocypraea* Schilder 1928.

Evolution and Distribution

Palliocypraea gastroplax occurred in the Tertiary from the Early to Middle Miocene, from the Batesfordian through the Balcombian and into the Baimsdalian (T. Darragh 1985). Chapman (1929) theorised that *P. gastroplax* occurred between 200 and 400 fathoms in the Balcombian Sea and up to 100 fathoms in the Muddy Creek region. However, present evidence indicates that the species did not occur in such deep water and would most likely have lived on the middle continental shelf at no more than 150 metres. Its most westerly known occurrence seems to have been in the Muddy Creek Formation in the Otway Basin, and to the east in the Balcombe Clays of the Port Phillip Basin.

Palliocypraea gastroplax occurred at a time when the greatest number of genera existed ie. from the Early to Middle Miocene and disappeared before the late Middle Miocene, when a large number of genera became extinct. Other species of *Cypraea* that became extinct at that time include *Zoila platypyga* McCoy 1876, *Rhychocypraea leptorhyncha* McCoy 1877 and *Umbilia eximia* Sowerby 1845.

They were followed by *Gigantocypraea gigas* McCoy 1867 and *Austrocypraea contusa* McCoy 1877 in the late Middle Miocene (Darragh 1985). The extinction of these species coincides with the decline in water temperatures of the southern oceans towards the end of the Tertiary.

Morphological Characteristics

The main body of this species is similar to many other cowries. It is pyriforme with a high dorsum, like some of the living species of *Zoila decipiens* and *Z. eludens*. The flange is thin and extends from the main body surrounding the entire shell. The dimensions of this specimen are as follows: the body length excluding the flange 87 mm, the width excluding the flange 59 mm. The total length is 102 mm, and the width 102 mm.

The flange varies from 23 mm to 25 mm wide and is less than 0.5 mm thick at the outer margins.

The inner layers are all the typical pyriforme shape as mentioned earlier. With such a large flange, it is difficult to imagine how the mantle could extend out over the flange and up over the dorsum. This specimen clearly shows the mantle line across the top of the shell. One can only speculate about what purpose such a large flange could have served for the species. The only modern cowry with any sort of flange is *Zoila marginata ketyana*, but the flange is a thick callous and not the delicate, thin flange we see in *P. gastroplax.*

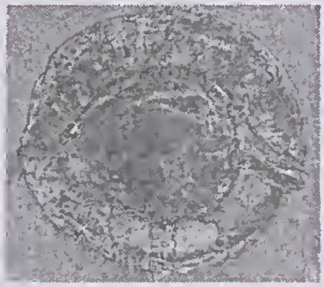

Figure 1. *Palliocypraea gastroplax X0.6, dorsal view.*

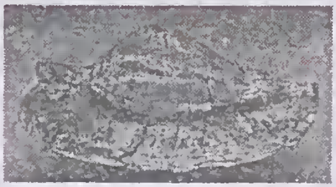

Figure 2. *Palliocypraea gastroplax X0.6, lateral view.*

Figure 3. *Palliocypraea gastroplax X0.6, ventral view.*

General Comments

Pieces of this fossil are occasionally found in the Fyansford and Balcombe Clays and the Muddy Creek Marl, but *P. gastroplax* is by no means common. Most of the pieces that I have found are the labrum side, together with the flange usually complete, or pieces of the flange. This leads me to believe that in spite of the delicate appearance of the flange, it is probably not as fragile as the dorsum.

Chapman (1929) states that the inner layer is seen on a weathered surface to show that the prismatic structure radiates across the flange, whilst the enamel layer of the flange itself, has a fibrous structure concentric with the periphery.

Palliocypraea gastroplax and Gigantocypraea gigas are the two of the most sought-after fossil cowries by fossil collectors and collectors of living *Cypraea* worldwide. The former because of its flange and the latter because of its size, being the largest species of *Cypraea* known worldwide.

Acknowledgements

I would like to thank Ken Bell for reading my manuscript and offering helpful suggestions and advice, and also to Tom Darragh for answering my queries.

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IN THE NEWS

Bones Make Feathers Fly

Despite recent doubts, the popular theory that birds evolved from dinosaurs may still be correct.

Researchers have discovered the microscopic channels that carried nutrients to the bone cells in the group of dinosaurs called coelurosaurs were organised in the same way as they are in birds today. The find suggests a strong link between this particular group of dinosaurs and modern birds. The researchers also found evidence that bundles of collagen fibres, which bind bone minerals, have the same irregular structure in both birds and coelurosaurs. The layers are thicker in some places than in others, and often they disappear completely before reforming. In modern vertebrates, this type of structure only occurs in bone that forms very rapidly, as it does in birds.

The well established hypothesis that birds evolved from dinosaurs recently took a severe knock. A team of Russian and American researchers claimed to have found feathers on the fossil of a small, lizard-like creature that lived 220 million years ago - about the same time dinosaurs began to roam the Earth - and 75 million years before the first known bird. *Longisquama insignis* was an archosaur, part of a group of animals from which dinosaurs, birds and crocodiles (bird's closest living relatives) are descended. The researchers questioned whether feathers could have evolved twice and suggested bird-like creatures may have evolved at the same time as, or even before, the dinosaurs.

Now the unique links between the bone structure of modern birds and coelurosaurs appear to push the arguments over bird evolution back towards the dinosaurs. "Right now, the thing that is closest to what we see in the bones of birds is in the bones of coelurosaurs. It doesn't necessarily prove that birds had to derive from dinosaurs. At least from the data we've seen that appears to be a logical conclusion, but there's still plenty of room for argument," says Professor John Rensberger, curator of vertebrate palaeontology at the Burke Museum, part of the University of Washington.

Professor Rensberger and Mahito Watabe, of the Hayashibara Museum of Natural Sciences in Okayama, Japan, made their comparisons using fossilised dinosaur bones collected from the Gobi Desert in China and from the Hell Creek Formation in Montana. The researchers sampled about 550 cross sections of bone, ground to a few microns thick, over the course of three years.

Summary of story from *BBC News Online*, August 14, 2000.

Scientists Find Earliest Sauropod

Meet *Isanosaurus attavipachi*, a sauropod dinosaur that was stomping around what is now Thailand quite some time before the start of the Jurassic period, 208 million years ago.

A hunter looking for nocturnal flying squirrels saw the tips of the creatures remaining bones gleaming in the moonlight. Scientists have now declared it the earliest known sauropod. Among the fourteen bones recovered was a femur, which enabled the researchers to estimate the creatures length at about 20 feet (6 metres), a size the researchers believe to be about half the size of an adult.

The Franco-Thai team of researchers, led by Eric Buffetaut of the French National Center for Scientific Research, recovered the remains in 1998 from an area on the Khorat plateau in Chaiyaphum province in northeast Thailand. What the find proves, the researchers say, is that sauropods were already widespread in the Triassic era, while most previous sauropod finds date from either the Jurassic or Cretaceous. This and other evidence "suggests that by the time of the Triassic-Jurassic boundary, sauropods already had a vast geographical," the scientists say.

Summary of story on *ABC News Online*, September 7, 2000.

Possible Warmer Climate

Scientists have uncovered the fossil of a 50,000 year old elephant in the Indian state of Kashmir. This was a big specimen, its head measured 5 feet (1.52 metres) by 4 feet (1.22 metres). Such fossils have been found further south, but this particular find indicates that the climate in the Himalayas was warmer 50,000 years ago than previously thought. If elephants thrived there, then other animals were also probably enjoying the mild climate of the time. This means that the Kashmir Valley could prove a happy hunting ground for future fossils, scientists say.

Summary of story on *ABC News Online*, September 7, 2000.

Oldest Fungi Found

Scientists have found the oldest fungi fossils known to date, the fossils are believed to be close to 460 million years old and indicate that fungi and plants may have worked together to begin the colonisation of land. Biologists aren't sure exactly when plants and fungi began their mutually beneficial association - which continues to this day - but this latest evidence suggests that it was quite early, possibly as soon as the first plants emerged from water. "The association might have been crucial for plants to conquer this new ecosystem," said Dirk Redecker, a biologist at the University of California at Berkeley and the leader of the study. Fossil records indicate that the colonisation of land by plants began around 440 to 505 million years ago.

The previous oldest fungi and land plant association were found in Scotland and are around 400 million years old. Redecker's team's results push this number back by another 55 to 60 million years, and also suggest fungi were linked to plants before they emerged from the sea. Meredith Blackwell, a biologist from Louisiana State University and not a part of the study said, "This is the fossil everyone has been waiting for." Around 80 to 85 percent of all modern plants has a relationship with a fungus living inside its root system, said Blackwell. The fungus provides the plant with phosphate, an essential mineral nutrient, while the plant gives carbon in return. It has been very difficult to find fossils of any plants more than 400 million years old. Plants before then - the first to emerge from the sea - had few hard parts that could fossilise after the plant's death, Blackwell said.

The fossils were discovered in rocks from Wisconsin by University of Wisconsin palaeobiologist Robin Kodner. The fungi structure found in the fossils look almost exactly like those formed by the modern family known as Glomales, said Blackwell.

Summary of story on *Discovery.com*, September 14, 2000.

Dinosaurs Not Cold-Blooded

Scientists have argued for years whether dinosaurs were cold-blooded or warm-blooded and lack of direct evidence, such as well preserved organs, makes it a difficult question to answer. However, geochemist Henry Fricke has found another way to tackle the problem; he studied the oxygen chemistry of fossilised dinosaur and crocodile teeth. Fricke discovered that the body temperature of meat-eating dinosaurs appeared warmer than cold-blooded crocodiles.

Using oxygen chemistry also provides a new line of evidence in the warm-blooded versus cold-blooded debate. Fricke, now at Colorado College, performed the work while at the Carnegie Institution of Washington. He and co-author Raymond Rogers, of Macalester College, presented their results in the September issue of the journal *Geology*.

Analysing oxygen chemistry is a popular method for evaluating ancient climates and fossils, but Fricke is the first to try the method on dinosaur teeth. Oxygen atoms can have three different masses, known as isotopes, scientists know that rainwater at higher latitudes contains more lighter oxygen isotopes than rainwater at lower latitudes. Previous studies have shown that rainwater's isotope ratio affects the ratio recorded in tooth enamel, since animals drink rainwater, but a cooler body temperature skewers the ratio.

Fricke and Rogers studied 75 million year old teeth from crocodiles and three dinosaur species - *Albertasaurus*, *Majungatholus* and *Saurornitholestes* - that lived in a wide range of latitudes. Fricke found that overall, the teeth of all the species studied reflected the rainwater ratio of the latitude. But he was surprised to find the crocodile teeth had slightly lower levels of lighter isotopes than the dinosaurs, body temperature is why, says Fricke. "This indicates the dinosaurs studied may have been internally regulating their body temperature. I think we've got some really good evidence that dinosaurs had a constant body temperature," said Fricke.

"The logic is sound," says palaeontologist Paul Koch, of the University of California at Santa Cruz. "It would be more compelling if you could compare the same dinosaur groups across different latitudes, but that's hard to do. I think it's a good first start," said Koch.

Summary of story on *Discovery.com*, September 14, 2000.

Giant Trilobite Discovered

The largest trilobite yet discovered has been identified by Canadian palaeontologists. The creature, which dates from 445 million years ago, measures 72 centimetres in length, this is about twice the size of the previous record holder.

Trilobites are probably the most common fossils of the Paleozoic Era (about 545-250 million years ago) and scientists use them to help date different layers of rock. "A trilobite of this size really is an amazing discovery," said Dr Graham Young, a member of the team that discovered it.

The specimen is an example of a previously unknown species, and was found by researchers studying ancient tropical coasts of the Late Ordovician and Early Silurian (458-408 million years ago), near Manitoba, Canada. Scientists realised just what a monster they had when they started to clean up the specimen. The fossil is now on display in the Manitoba Museum of Man and Nature in Winnipeg.

"We have found a very unusual specimen that illustrates some of the diversity and weirdness of ancient life, a trilobite of this size really is an amazing discovery," said Dr Young.

In 1998, the team set out for northern Manitoba hoping to find fossils similar to those uncovered by previous digs, like the 43 cm long trilobite excavated in the area a decade before. The team found the new specimen just outside the original search area. The trilobite's size also contradicts the idea that larger animals are more commonly associated with colder climates.

Summary of story from *BBC News Online*, October 9, 2000.

Dig Recovers Five *T. rex* Specimens

The discovery of five *Tyrannosaurus rex* skeleton during a single summer dig in the United States could mean these creatures were more common than previously believed, according to the leader of the project, Jack Horner. The remains were found between June and September, 2000, in the Fort Peck Reservoir area of Hell Creek, Montana, which is a famous dinosaur hunting ground.

Horner, head of palaeontology at the Museum of the Rockies in Montana, described his team's find as very unusual. "On average, a *T. rex* is discovered once every ten years, to find five in one summer and in one area is very surprising," he said. Horner is not willing to be drawn into immediate conclusions about the scientific significance of the discoveries, but he concedes that it might mean the creatures were more common than previously thought.

There is great excitement about one of the specimens as early indications are that it could be the largest *T. rex* yet discovered - bigger even than Sue.

Summary of story from *BBC News Online*, October 10, 2000.